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IN THE CLAIMS:

1. (Currently amended) Apparatus for leak detection, comprising:
a sealable chamber configured to receive and enclose a test piece that, while in the chamber, contains a trace gas;
a trace gas permeable member mounted in gas communication with the chamber; and
a trace gas sensor comprising an ion pump in gas communication with the permeable member and configured to sense trace gas that passed from the chamber through the permeable member to the trace gas sensor, the sealable chamber being isolated, during leak detection by the ion pump, from gas communication with a vacuum pumping device other than the trace gas sensor and form any inlet to the sealable chamber.
2. (Original) Apparatus as defined in claim 1, wherein the permeable member comprises a quartz member.
3. (Original) Apparatus as defined in claim 1, wherein the permeable member comprises a quartz member, the apparatus further comprising a heating element in thermal contact with the quartz member and a heater controller configured to control the heating element.
4. (Original) Apparatus as defined in claim 1, wherein the permeable member comprises a polymer member.
5. (Original) Apparatus as defined in claim 1, wherein trace gas permeability of the permeable member is controllable.
6. (Original) Apparatus as defined in claim 1, wherein the permeable member is permeable to helium.

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7. (Previously presented) Apparatus as defined in claim 1, wherein the trace gas sensor includes means for sensing the trace gas at a specified time after the test piece containing the trace gas is placed in the chamber.
8. (Previously presented) Apparatus as defined in claim 1, further comprising a housing enclosing the permeable member and the trace gas sensor and a vacuum flange for attaching the housing to the chamber.
9. (Currently amended) A method for leak detection, comprising:
providing a sealable chamber configured to receive and enclose a test piece, a trace gas permeable member in gas communication with the chamber and a trace gas sensor comprising an ion pump in gas communication with the permeable member, wherein the sealable chamber is isolated, during leak detection by the ion pump, from gas communication with a vacuum pumping device other than the trace gas sensor and from any inlet to the sealable chamber;
placing in the chamber a test piece that, while in the chamber, contains a trace gas;
passing the trace gas from the chamber through the permeable member to the trace gas sensor; and
sensing the trace gas that passed through the permeable member with the trace gas sensor.
10. (Previously presented) The method as defined in claim 9, wherein the permeable member comprises a quartz member.
11. (Previously presented) The method as defined in claim 9, wherein the permeable member comprises a quartz member, the method further comprising heating the quartz member.
12. (Previously presented) The method as defined in claim 9, wherein the permeable member comprises a polymer member.

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13. (Previously presented) The method as defined in claim 9, wherein the permeable member is permeable to helium.
14. (Previously presented) The method as defined in claim 9, wherein passing the trace gas through the permeable member comprises controlling trace gas permeability of the permeable member.
15. (Previously presented) The method as defined in claim 14, wherein controlling trace gas permeability of the permeable member comprises controlling sensitivity of leak detection.
16. (Previously presented) The method as defined in claim 14, wherein controlling trace gas permeability of the permeable member comprises controlling temperature of the permeable member.
17. (Previously presented) The method as defined in claim 9, wherein sensing the trace gas comprises sensing helium.
18. (Previously presented) The method as defined in claim 9, wherein sensing the trace gas comprises sensing the trace gas at a specified time after the test piece containing the trace gas is placed in the chamber.